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POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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Where to Buy It in the West, Pages 9, 10. Alphabetical Index to Advertisers, Page 8.

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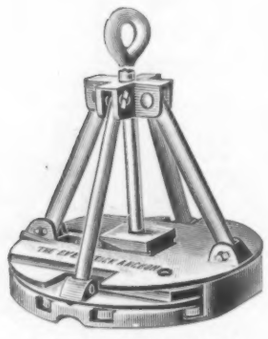

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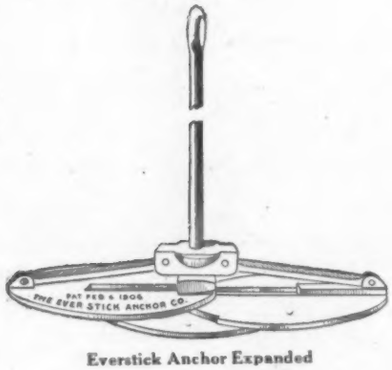

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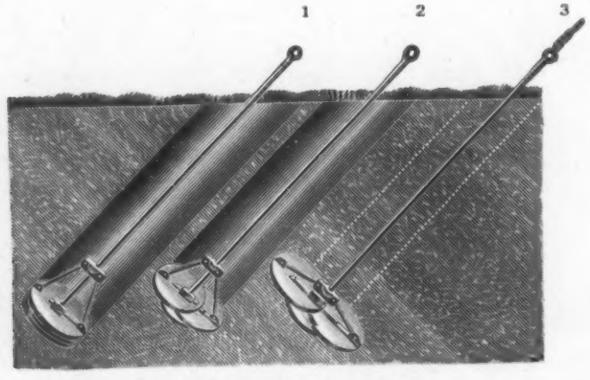

1—Anchor at bottom of hole
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POWER AND GAS
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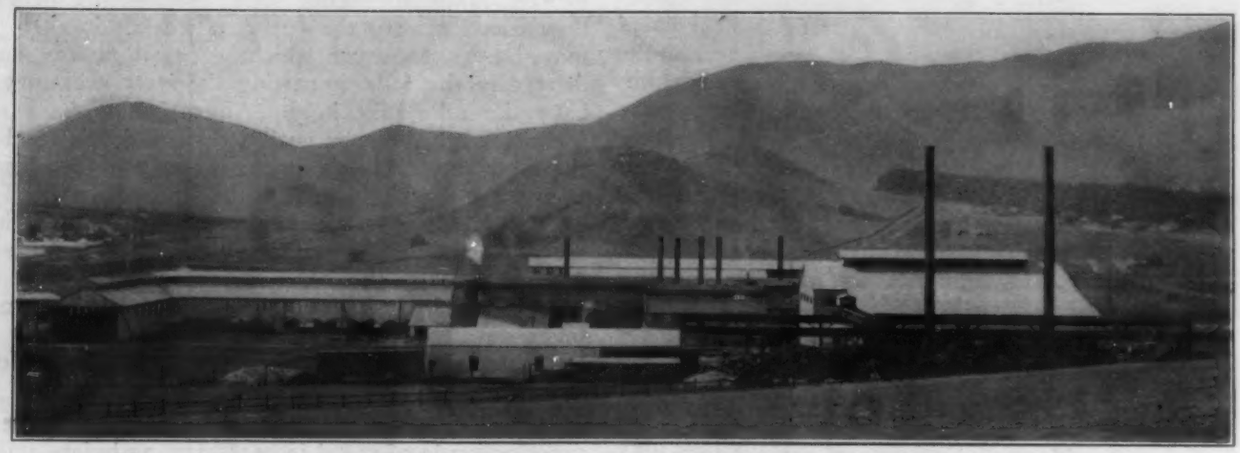


View of Plant from the East; Furnace Building and Raw Material Yard on the Right; Rolling Mill and Boiler House in Center Background.

PACIFIC COAST STEEL CO.'S SAN FRANCISCO PLANT

BY RUDOLPH W. VAN NORDEN.
Member A. I. E. E., A. S. C. E.

We have become so used to the thought of sending to the Eastern markets or abroad for structural iron and steel, that it is hard to realize that California has within its gates the materials, the fuel, the power, the capital and the conditions for the manufacture of these products. San Francisco has not been the center of manufacture that is the right of one of the greatest and most important seaports in the world, chiefly on account of the labor conditions and former lack of cheap fuel. The previous apathy is being gradually overcome, capital is discovering that there is a need for home industries, and the unequalled supply of electric energy, as well as fuel oil, is now contributing its influence in bettering conditions.

The Pacific Coast Steel Company is a pioneer in the manufacture of high grade mild steel for building materials,—reinforcing bars and structural shapes. Its construction of a modern plant at South San Francisco was a daring experiment that required faith in the future of the local market. The success of the venture now seems assured. It was realized that a market for this material would be in constant and close competition with products imported into the domestic field and that the success of the plant would rest largely on the care of manufacture and the high grade of the product. The plant was therefore designed and built to this end. The process of manufacture is that known as the "basic" in which the mixture, in distinction to the "acid" process, contains a lower percentage of impurities,—phosphorus, sulphur, etc., and results in a tougher, more easily worked metal which can be bent cold and has a high resistance to shocks and strains. Siemens-Martin "open-hearth" furnaces are used and the smelting in these furnaces is practically the first movement toward the finished product.

A look at the material pile from which the product is manufactured would give the uninformed person the impression that anything in the nature of scrap iron was used. This is not the case, however. The greatest care in the selection of junk is employed and is indeed necessary, because every batch from the "melt" must contain certain ingredients in proper proportions, otherwise the finished product would not meet specifications or stand the tests. The scrap pile consists of steel rails, old cables, old structural steel, dredger buckets and all sorts of old steel plates and castings. This junk is broken to a size which will enter the furnaces and when the charge is made a certain amount of pig iron, California iron ore and other materials, including quartz flux and limestone,

are added to give the proper chemical and mechanical constituency.

The following is an analysis of elements other than iron, from a test piece, taken from the melt before it is cast into ingots from which cold twisted reinforcing bars are to be made:

Carbon	0.19 to 0.24 per cent
Manganese	0.45 to 0.55 per cent
Phosphorus	up to 0.06 per cent
Sulphur	0.04 to 0.05 per cent

The charge is placed evenly over the bed of the furnace which is already heated to the proper temperature. The Siemens-Martin furnace consists of a hearth or bowl shaped bed which is completely covered with an oval roof of fire resisting material. At both ends of the hearth are openings into rectangular chambers which extend down lower than the hearth and at the bottom of these chambers are openings into the chimney flue through which the products of combustion are carried into the high steel stacks. These chambers are filled with fire brick known as checkerwork, and laid as the name would suggest to give spaces between the bricks. There are dampers in the chimney flues which work automatically so that when one is open the other is closed. The checkerwork chambers give the reverbatory action as follows: The flame from the oil burner at one end of the furnace plays over the bath of metal. Air is introduced under pressure through the checkerwork of the chamber closed to the chimney. The checkerwork from the previous blast in the opposite direction being already at a high temperature, the incoming air picks up this stored heat which is carried over the bath and imparts heat thereto. It then passes through the other checkerwork to which it gives up its remaining heat and thus brings these bricks to a high temperature. After this action has taken place for a certain time, the dampers and drafts are reversed and the process repeated in the opposite direction.

Raw Material Yard; Crane and Lifting Magnet.

When the metal is thoroughly melted and is found by test to be the correct mixture, it is drawn into a giant ladle holding the entire charge of the furnace, this ladle having been previously heated on the inside to prevent chilling of the charge. The ladle is lifted and moved to any place on the foundry floor by two travelling cranes and the metal is poured into molds. These have the appearance of old-fashioned cannon and are cast iron tubes which contain the sand mold for the ingot. The molds are placed on end in a long pit, there being six in each group, side by side, which are poured at once, connection between the molds being at the bottom. These ingots are known as, "bottom poured ingots." The ingot is a solid rectangular chunk of steel, 8 in. square and about 5½ ft. long. They are piled nearby until sufficiently cool when they are transferred to the reheating furnaces preparatory to rolling into the final shapes. The travelling crane loads the ingots in groups of six to a car which conveys them to the reheating furnace. They are then fed through a door in the end of this furnace, being placed cross-wise to the furnace. The latter is long and narrow, the hearth slanting toward the lower end whence the ingots are removed. Loading is done with a hydraulic lift which automatically opens the furnace door as it shoves the ingot in. The furnace holds 40 ingots which accumulate heat as they travel toward the outlet. The hot ingot is removed by a conveyor which places it at any point desired in the rolls, imparting the start necessary to have the rolls take hold. After passing back and forth through the rolls until a certain size is reached, the ingot, now a billet, is cut off at a proper length to give the specified length of the finished shape. This is done in a shears. The billet is now reheated in a second reheating furnace if necessary, or it is passed directly through the 10 in. finishing rolls which impart the desired shape. The finished bars are now taken on a conveyor to the hot table where they are straightened and cut and finally twisted if this form is necessary.

In placing material of this sort on the market a superior grade of metal is necessary, as before stated. Especially true is this of rails, twisted and deformed bars. Steel made by the open-hearth process possess the advantages necessary for cold twisting and bending. By other processes a steel of higher tensile strength may be had, but possessing a lower bending moment. Square bars are twisted cold and this results in raising the tensile strength.

The rolling mill is in reality in two parts. The heavy 18 in. ingot rolls handle the tie-plates, rails and structural shapes which travel to the north end of the mill. The smaller 10 in. finishing rolls make the square and deformed reinforcing bars and these travel to the opposite end of the mill. It is therefore possible to manufacture both types of material at once.

This plant is designed to be operated throughout with electricity. All mechanical movements are to be made with motor drive with the exception of the hoists which charge the furnaces. At present the principal machines where power is required, the rolls, are driven by cross compound steam engines, these are however soon to be replaced with variable speed, heavy-duty induction motors. At the time this plant was built it was found impossible to obtain a sufficient amount of power for the work and the engines were installed as a temporary expedient. All of the motors so far installed are direct current shunt wound machines and operate at 250 volts. This current is generated by two 50 kw. sets each driven by a single non-condensing engine. In anticipation of the power soon to be received from one of the transmission power companies, there has been installed a two-phase rotary converter with the necessary transformer and switchboard equipment. The mill motors will operate directly from the 10,000 volt three-phase supply.

Description of Motor Equipment.

The scrap or raw material yard is spanned by a travelling crane. The crane rails are heavy girders mounted on two rows of buttressed columns which give the crane a clearance above the ground of 24 ft. The span is 75 ft., and throughout this span are the piles of scrap iron and steel to be used as needed. Space is left for a railroad track under the span and parallel to the direction of travel. The crane is electrically operated throughout, having a 21 h.p. motor on the bridge, a 5 h.p. racking motor and a 21 h.p. motor on the hoist which has a capacity of 25 tons. In lifting the raw material from the cars to the piles, a 43 in., 3 ton Cutler-Hammer lifting magnet is used. This is energized from the 250 volt motor circuit.

There is to be installed a motor operated charging machine, the various movements of which will be actuated by one 21 h.p., two 8½ h.p., and one 3½ h.p. direct current motors. This machine, equipped with variable speed controllers, which is built of heavy structural steel shapes, will travel along the charging platform on a track and its duty is to pick up a steel hopper in which the raw material has been piled, carry the hopper to the proper furnace door, shove it into the furnace, emptying the charge by a half turn of the charging head and withdrawing the empty hopper. With the charging machine it will be possible to make three eight-hour heats of the furnace each day. With the present method it requires seven hours to charge by manual labor.

California crude petroleum is supplied through Tait & Jones burners with the aid of a air jet. The oil and air are controlled from a stand at the outer edge of the charging floor.

The open-hearth furnaces are lined on the sides and top with a silica brick to withstand a temperature of about 3500 degrees Fahrenheit. The checkerwork also has this brick but the hearth on which the bath rests is of magnesite brick. It requires eight to nine days to bring the furnace to the proper heat for operation and then the magnesite bottom must be set to put in condition for the molten bath. It is possible to run, where oil firing is used, about 340 heats before it is necessary to reline the furnace. Where producer gas is used for heating, only about one-half the number of heats can be made. From the time of charging to that of pouring requires less than eight hours. A charge weighs about 25 tons. The furnaces and charging platform occupy about one-half of the building longitudinally, which like all of the buildings is of steel and corrugated iron and is 121 ft. long and 90 ft. wide. The other half is the casting floor where the ingots are made. There are two travelling cranes, the one a Case double crane has two hoists of 30 and 5 tons. This crane is driven by direct current motors as follows: One 25 h.p. bridge motor, one 25 h.p. and one 15 h.p. on the respective hoists and two racking motors of 7½ and 5 h.p. The other crane used for stripping the molds has a capacity of 10 tons. It is driven by three motors of 13 h.p. for the bridge, 10 h.p. on the hoist and an 8½ h.p. racking motor.

The boiler house, a building 40 ft. x 70 ft., adjoins the rolling mill building and is equipped with four 280 h.p. Babcock & Wilcox boilers in two batteries. These supply steam for all the uses about the plant. On the main floor is a Gardner air compressor, belt driven through a countershaft by a 15 h.p. direct current motor. This supplies air for the furnaces. In the pit at one side of the boiler house is a combination vacuum and circulating beam pump and a surface condenser which operate on the exhaust from the large engines, although these are generally operated non-condensing. There is also a Dow three-throw plunger

Open Hearth Furnaces and Charging Floor.
Ingots and Hydraulic Lift Charging Re-Heating Furnace.
Babcock & Wilcox Boilers and Air Compressor.
25-Ton Ladles and Ingot Casting Floor.

Table for Charging Ingot Rolls; Rolls on Right.
A Re-Heating Furnace (Left); Finishing Rolls (Right).
Hot Table Showing Motor Driven Conveyors.

pump driven by a 15 h.p. direct current motor which supplies water under pressure for various uses about the plant. A 23-ton floating pressure equalizer maintains a constant pressure on this system which operates at 400 lb. per sq. in.

The rolling-mill engines were built by the Union Iron Works and are similar, the one driving the 18 in. ingot rolls has a rating of 900 h.p.; the other which drives the 10 in. finishing rolls is rated at 350 h.p. They are cross compound and condensing.

The present current supply is from two 50 kw. multipolar direct current generators, the one being direct connected to a 100 h.p. tandem compound Ideal engine operating at 300 r.p.m., the other is driven through belt and pulley by a Erie City 75 h.p. simple engine. A 6 panel switchboard mounts two main generator knife switches and 12 switches for the various motor circuits.

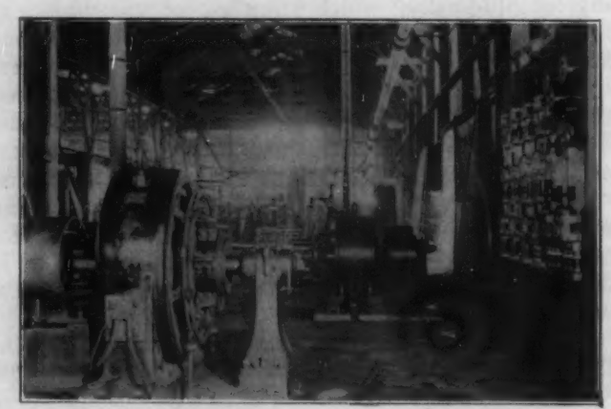
The three-phase, 10,000 volt current supply recently installed is brought into the building to two 100 kw. oil-immersed and air cooled Westinghouse transformers, having Scott three-phase to two-phase connection and these have a secondary potential of 176 volts for supply to the rotary converter. The rotary is a Westinghouse 250 kw. operating at 514 r.p.m. and will supply current at 250 volts for all of the motors in the plant except the mill motors which will displace the engine driven sets. The switchboard is a Westinghouse white marble in three panels with instruments and circuit-breakers for the rotary-converter and the 10,000 volt lines.

After leaving the rolls, a bar is carried to the desired place on the hot table by a roller conveyor. This consists of horizontal rolls 8 in. diameter, spaced 4 ft. apart, and on their shafts are pulleys over each of which a belt runs. This belt is driven from a countershaft by a 5 h.p. motor, there being three of these sets. A 10 h.p. motor drives a finishing shears at the end of the hot table, these will cut cold steel up to 1¾ in. diameter. At the end of the hot table for the ingot rolls is a shears driven by a 25 h.p. motor which will cut cold steel up to 2 in. x 6 in.

The billet shears, which cut off the hot billets coming from the ingot rolls, will cut up to 4 in. square. This shears is driven by a 15 h.p. motor.

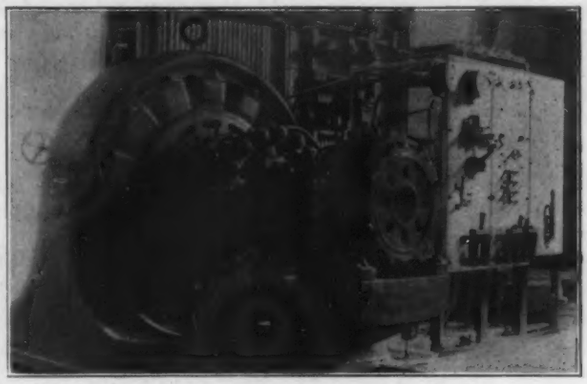
The machine, or "table," which delivers a billet to the rolls has three motors. This table has three motions. On its surface is a set of rollers which move the billet forward or backward driven by a 12.5 h.p. motor equipped with a magnetic brake. The bed of the table is tilted to meet the upper or lower rolls by a motor of 12.5 h.p. and the whole mechanism moves across the face of the rolls as a transfer table and is driven by a third motor of the same size as the others. Three variable speed controllers are mounted at one side of the machine where the attendant can see all operations.

When twisted bars are required they are taken from stock in the building at the end of the hot tables. The twisting machine is a simple affair. A 12.5 h.p. induction motor is belted through a countershaft, to give the correct speed to a spindle which is geared to two spindles which operate in opposite directions. These have at the end of their short shafts, sockets with a square opening in which fits a chuck, the latter being of the right size to take the bar to be twisted. The bars, which are square, are placed one end in the chuck and the other in a movable vise and the motor is started and stopped when the proper number of turns has been given to the bar. If there is any imperfection either in the chemical or physical property of the bar or in the mechanical formation, it will show under this twisting test.



Direct Current 50 kw. Generators and Switchboard.

The rolling mill building including the space occupied by the engines and electric generators is 500 ft. long and 80 ft. wide. At the south end is a shipping room wing 110 ft. x 200 ft., and at the north end a similar wing 40 ft. x 200 ft.



250 kw. Rotary Converter and Switchboard.

The remaining buildings are a storehouse which will hold 5000 tons of finished product; a tool and supply house and a laboratory.

Much of the machinery and equipment of this plant was built on the ground by the company's engineers and there is a shop equipped with the necessary tools for replacing gears, rolls and other important parts.

LIGHTNING IN RELATION TO FOREST FIRES.

Transmission companies operating across the national forests will be interested in the summary of conclusions brought out by an exhaustive research into lightning discharges recently brought to a close of the department of agriculture and set forth in forest service bulletin No. 111. The superstition of centuries that certain species of trees are struck most by lightning is seen to be up-rooted. The summary of conclusions shows:

1. Trees are the objects most often struck by lightning because: (a) They are the most numerous of all objects; (b) as a part of the ground they extend upward and shorten the distance to a cloud; (c) their spreading branches in the air and spreading roots in the ground present the ideal form for conducting an electrical discharge to the earth.

2. Any kind of tree is likely to be struck by lightning.

3. The greatest number struck in any locality will be of the dominant species.

4. The likelihood of a tree being struck by lightning is increased: (a) If it is taller than surrounding trees; (b) if it is isolated; (c) if it is upon high ground; (d) if it is well (deeply) rooted; (e) if it is the best conductor at the moment of the flash; that is, if temporary conditions, such as being wet by rain, transform it for the time from a poor conductor to a good one.

5. Lightning may bring about a forest fire by igniting the tree itself, or the humus at its base. Most forest fires caused by lightning probably start in the humus.

SHOULD GAS COMPANIES ENGAGE IN THE SALE OF APPLIANCES.[1]

BY L. H. NEWBERT AND H. P. PITTS.

The introduction, from time to time, of improved gas consuming appliances has been an important factor in the gas world, and has had a very beneficial effect on the business, and, as the prosperity of gas companies depends altogether upon the use of gas consuming appliances by their customers, the question of how best to increase and promote the sale of such appliances is one of utmost importance and brings us to the subject of this paper—"Should Gas Companies Engage in the Sale of Gas Appliances."

The question was recently put to an appliance dealer in a large city, and he promptly replied "no," and gave substantially the following reasons to justify his reply: "A company organized to supply gas should confine its operations to its manufacture and distribution, and should co-operate with dealers in the matter of the sale of appliances for both light and fuel purposes, particularly fuel. He argued that competition was the life of trade, and that if gas companies sold appliances there would be no competition, unless there should be more than one company in the field, and such is very seldom the case. He called attention to the fact that in the city in question the gas company does not handle appliances except for lighting, and then only to a limited extent, with the result that nearly all the retail hardware stores and many furniture stores, and some purely appliance stores, were selling appliances, each having an active selling force constantly in the field, with the result that the gas company was getting what it was properly entitled to, i.e., increased gas sales, and the dealers getting the appliance business, all of which was admitted to a certain degree; but, do all users of gas obtain thoroughly satisfactory appliances was asked. The dealer thought they did, as he called attention to the fact that he carried only well known reliable makes of ranges, water heaters, etc., which he sold at what he thought a fair price, i.e., a price which allowed a profit of about 33 1/3 per cent, including delivery and connecting.

The writers admit that the matter of the sale of appliances is not a one-sided question, and that there is merit in the argument of the dealer quoted. True co-operation between gas companies and dealers is, in theory, ideal, but can it be accomplished? Will the dealers, for instance, endeavor to sell a gas range yielding a profit of, say $5, whereas a coal or wood range might be sold and yield a profit of $10, and, again, will a dealer try to persuade a prospective purchaser to buy a gas range when a plate is desired? Some perhaps would while others would not.

One of the writers had occasion some time since to discuss with several dealers in a certain city the question of the sale of gas appliances. The gas company had, for several years, discontinued handling appliances, but because of the unsatisfactory increase in gas sales had announced that, at the expiration of three months, it would re-engage in the sale of appliances. The dealers protested, claiming that they had actively pushed the sale of gas appliances and had co-operated with the company in every possible way,

[1]Paper presented before Pacific Coast Gas Association, Sept. 18-20, 1912.

and, if the company should re-engage in the appliance business, that they would suffer a considerable loss. Their attention was called to the fact that the gas company had, during the previous year, turned over, as the result of canvasses made, more than 300 prospects for ranges and water heaters, and that only about 65 sales had resulted, which was considered a poor showing, and did not indicate active work or hearty co-operation on the part of the dealers. The gas company did resume the sale of appliances, and for the year ending June 30th, 1912, sold 626 appliances.

Gas companies want to sell gas; they want to increase their annual sales, therefore, should they not give the most serious consideration to the introduction of gas consuming appliances on their distributing system, and are they not almost justified, not only in installing without charge, but in addition thereto, furnishing appliances of certain types free? Would not the increase in the use of appliances justify such a course? We believe the question worthy of consideration. Take for instance, a hotel range costing, installed, in the neighborhood of $200. Thirty dollars per month is a conservative estimate of the consumption of gas, or an annual return of $360. Would not this be considered good business? Yet how many gas companies provide appliances free? And what is true in the case of the hotel range is equally true of other appliances, particularly industrial, and this brings us to another phase of the question, which is entitled to more than passing notice.

The introduction of industrial appliances is today attracting the attention of every gas company, and has opened a new field for the sale of gas, especially on the Pacific Coast. How many appliance dealers are giving any attention to this feature of the gas business? And how many are qualified to do so? None we venture to say in nine cities out of ten. This being the case, is it not absolutely necessary, and does not good business procedure require that gas companies handle industrial appliances, and, if so, why not all kinds of appliances?

The policy of the gas company should be that it is not only selling that commodity known as "gas," but that it is selling "service." The mere matter of an exchange of money for a certain number of cubic feet of gas, which the consumer may have used, is not the only item of consideration in the operation of the business department of the gas company. What it wants to deliver is not only the raw material, but the finished product, and this finished product may be summed up in one word—"service," so that to be consistent with itself and with the consumer it would show courtesy and truth in taking the order, promptness and dispatch in delivery, cleanliness and speed in making connections, and prompt attention in the maintenance of the appliance, and right here in the last clause is the keynote of "service." And how, may we ask, is this service to be rendered, if the gas company is not in a position to furnish each and every item which goes to make up the "service."

Leaving out of consideration all question of policy in the matter of co-operation with dealers in order to secure their good will, is it not but fair on the part of the gas companies in dealing with their consumers to furnish them with appliances at a very reasonable figure, if not at cost, or even less than cost. Is not the consumer entitled to this consideration? Is it not a factor in the business that gas companies should give more than passing notice? What more can gas companies do in addition to furnishing good gas than to provide their consumers with the opportunity of obtaining good reliable appliances—appliances that will give proper service and materially aid the company in furnishing consumers what they are entitled to, namely, "perfect service"?

Public service corporations are today, more than ever, endeavoring to retain the good will of the general public, and are spending time and much money to accomplish this end. Will not the supplying of appliances on liberal terms, more liberal than the dealer can afford to offer, and at prices which the dealer cannot approach, do much to bring about that condition of affairs so much desired,—absolute confidence between gas companies and their consumers

A gas company handling appliances puts itself in the position of protector to the consumer as well as of itself. In order to substantiate the contention that they should deal in appliances the following reasons are given:

First—Having sufficient capital to properly equip an appliance store, to give liberal terms and sell on a close margin, giving the consumer benefits impossible to be obtained from the small dealer.

Second—The gas company can well afford to stand back of and maintain appliances sold, keeping appliances in first-class shape and assuring a constant revenue from satisfied customers.

Third—By selling only appliances of high efficiency complaints will be minimized, and more satisfied customers guaranteed.

Fourth—They will be in a position to classify appliances and force all dealers to handle good appliances and sell at consistent prices.

Fifth—It creates a closer relation between the company and the customer, besides demonstrating to the general public that the gas company has confidence in its products and appliances.

Sixth—Affords an opportunity of educating employes in the possibilities of gas as a fuel, developing good appliance salesmen, and perfecting the organization.

Seventh—For economic reasons. Why the necessity of a consumer making a contract for gas in one place and then going to an entirely different concern to purchase an appliance which is useless without the manufactured product? It is only a simple process of arithmetic to prove that "service" can be handled cheaper under one head than two.

Eighth—Last, but not least, for strictly business reasons in the way of increasing the daily output. An appliance store properly operated by the gas company should certainly maintain itself and pay interest on the investment. When they are showing increased sales of high class appliances and an increase in gas output each month, then they have an almost perfect organization. An organization to show a constant increase in business must work in harmony and with a constant aim in view.

OWNERSHIP OF PUBLIC UTILITIES.

BY JOHN B. MILLER.[1]

There are only two kinds of public utilities ownership—private ownership and public, or as it is more commonly called, municipal ownership. The public is entitled to expect the same treatment from either kind of ownership; that is, good service at the most reasonable rates with a liberal policy as to extensions. These three things depend upon:

First—An efficient, alert, and as near as may be, unchanging management and force of employes.

Second—The command of sufficient money at a not undue cost to promptly make needed extensions.

The only advantage which municipal ownership possesses over private ownership is that, in California at least, municipal bonds can be sold on a slightly lower interest basis than privately owned public utility bonds. Another advantage which it may be said to possess is that as a rule municipally owned plants are not operated for profit, which should enable them to make a somewhat lower rate than privately owned plants can do. There are, however, two sides to this question. By many it is maintained that this is not really an advantage, as money must be had for extensions and this money must be obtained by the sale of municipal bonds, so that the consumer and taxpayer make up the difference in the low rate by increased taxes.

This difference in the cost of money reflected in the average consumer's light bill is not over a few cents a month and the advantage of it is more than compensated by the likelihood under municipal ownership of the presence of certain evils extremely inimical to good service, economical management and prompt satisfaction of public demands for service and extensions. For instance, I state above that in order to bring the people what they are entitled to receive in the way of good service, etc., the management and the force of employes must be quite efficient and as long in tenure of service as possible. This is almost impossible to obtain under municipal ownership, because instead of alert, efficient business men being obtained for management, whose only idea is that of efficiency and devotion to duty, the manager and employes are more apt to be selected, either because of political influence or ability to manipulate the plant and its system in such a way as to make political capital for the mayor, common council, or other political backers behind them.

Again, it is most difficult for municipally owned plants to obtain help, or management of the highest order, because men of ability and experience much prefer employment with privately owned corporations, where their tenure depends solely upon their ability and loyalty, and in no respect upon their ability to do politics or influence votes.

Under municipal ownership as a rule plants are not operated for profit, or even if so, cannot be expected to earn but a moiety of the amount necessary to meet the demand for extensions, and there is great likelihood of stagnation. If the city or territory served by the municipally owned plant, grows after its first installation to a point where there is additional territory and consumers clamoring for extensions, these cannot be made except by the sale of bonds. Municipal ownership bonds must be voted by the people. The majority of the people concerned are already served with electricity, and to vote more bonds to run extensions to sparsely settled territory would mean for those who already enjoyed service only an additional tax. Consequently it has been the experience that under municipal ownership extensions are not made with nearly the liberality or promptness that exists under private ownership.

It has long been the opinion of the best thought on public utility matters that the people are best served by having the municipality own and control all utilities having to do with health and sanitation such as water, sewers, policing of streets, etc., but all other utilities calling for a more or less high degree of technical ability and the employment of a great many men, —such as transportation, telephone, telegraph, electric light, gas, etc., carrying the chance of hazard not only financially, but as to life and property, can best serve the people when privately owned and publicly regulated.

In order to give the people the best service and the lowest rates all public utilities should be natural monopolies.

As evidence of this you have simply to call to mind the situation where two competing telephone companies serve the same community. While the annoyance and cost is not relatively so great where two competing electric companies serve the same communities, it is almost as great because of their duplicate use of the streets and alleys, and it is just as great in case of a consolidation of the two companies (and this is almost always eventually the case) as interest must be earned upon a double investment and the cost almost invariably falls upon the consumer.

These companies should be properly regulated by a state board consisting of men chosen for the purpose, and if possible appointed for life or good behavior, but if not, for extremely long terms. Such appointments should carry good, high salaries, so as to command men of the very highest ability, intelligence and character. A state board should have full power to regulate rates, service and financing and no company should be allowed to establish business until it has obtained authority from the state board. We do not have this kind of regulation in California as yet. It is largely because this question of regulation is understood only by comparatively a few. This is principally our fault, as we who are more vitally interested than anybody else, have not been as enterprising and industrious as we should have been in the education of the rest of the community. With this kind of regulation in which the investor as well as the consumer is protected, and justice given to both, the business will take on a character of such greater stability as to enable it to obtain its money at substantially as low a rate as municipalities can do. When this condition obtains, as it is sure to do in time, private ownership under scientific public regulation will afford the most advantageous method of serving the people with public utilities other than those having to do with health and sanitation. It will provide them with all the advantages possessed by municipal ownership and none of the disadvantages such as political management, inability or unwillingness to make extensions, etc., etc.

[1]President Southern California Edison Company, Los Angeles.

FIELD MEASUREMENTS OF PUMP DISCHARGE.

[The Energy Club is an informal organization of San Francisco power and machinery men which meets at lunch at the Palace Hotel on Wednesday noon. Pumping for irrigation has been the main topic for discussion in the past. On October 2 Professor W. T. Durand of Stanford University spoke on the Diesel Engine and on October 9 Prof. E. B. Etcheverry of the University of California will speak on Irrigation. The following paper is the recommendations for field measurements of pump discharge by a committee consisting of A. C. Paulsmeier, H. P. Pitts and Fred Hanson. —Editor.]

We are agreed that the ordinary test that can be made in the field under almost all conditions is that of measuring the quantity of water by means of a weir box and obtaining the suction and discharge head by means of gauges; the horsepower input to motor to be ascertained by watt meter or other electrical instruments as commonly used for that purpose.

We recommend the weir box method because it can be built of material that is available almost anywhere. Furthermore, a weir box can be installed permanently, and gives the rancher or other water user a constant check on the amount of water that his pump is delivering. This amount may vary considerably during a season, owing to the fluctuating water plane. Many ranchers, particularly in Southern California, are now, and have been, installing discharge boxes made of concrete, arranged with a weir in one corner, consisting of a piece of plate steel embedded in the concrete, giving them a fair measurement of the amount of water delivered by the pump. The only criticism that might be made in this connection is the tendency to make the discharge boxes so small that the water approaches the weir with considerable velocity, meaning inaccurate measurement and indicating a greater discharge than that for which the pump is given credit.

We are aware that for large pump units a weir box is not to be recommended, because of the expense entailed in the building of them, and other means, such as pitot tubes, should be resorted to. This is particularly important in pumps used for reclamation service, where it would be rather difficult to measure the water, as it is generally discharged into the river, and any measurements that were taken would have to be made on the suction side.

Your committee believes, however, that pitot tube measurements should only be taken by an expert, as the accuracy of measurement by this means depends upon careful calibration of the instrument.

Your committee calls attention to several points in connection with the suction and discharge piping on pumps and the position of gauges when inserted in these pipes, for the purpose of ascertaining suction and discharge head. It is one of the rules to place these gauges always in that portion of the pipe which is subject to the lowest possible velocity, and in this connection, we should like to impress most forcibly upon anyone who has any connection with the operation of pumps, that the water entering the suction of a centrifugal pump should have its velocity increased gradually, and it can only be properly done by means of a taper. A taper discharge piece is also of importance. The gauges should be tapped into the large end of these tapers, or immediately outside of these in the piping, as there the velocity is comparatively low and a true reading may be ascertained. It is better to neglect the friction head occasioned by passing the water through the tapers than place the gauges near the pump where the velocity is probably quite high, and where a true reading cannot be obtained.

We believe that it is agreed by all that a pressure gauge indicates the pressure in pounds to the center of the dial, and that a vacuum gauge indicates the vacuum in the suction at the point where it is tapped into the pipe or other part of the suction connection; also, that the vertical distance between the point of tapping into the suction pipe and the center of the dial of the pressure gauge must be added to the head indicated by the two gauges.

This is the usually accepted method for obtaining the total dynamic head against which a pump operates, but it may be of interest to state that the vacuum gauge indicates the velocity head in the suction; in other words, the head, namely $\frac{v^2}{2g}$ represents the energy required to bring the water from a state of rest into that of the particular velocity that prevails at the point where the gauge is connected. Such velocity head, should, theoretically speaking, be deducted from the suction head; on the other hand, the pressure gauge on the discharge pipe does not indicate the velocity head of the discharge water, and for all ordinary purposes one may neglect these values as they will practically offset each other.

As to the size of weir boxes, your committee is not at this time ready to make any specific recommendation, as it would be necessary to make up some sort of table to cover boxes of different capacities. The main point to be considered in any weir box is to construct it in such a manner that the velocity of approach is practically nil.

Quoting from Professor G. E. P. Smith in Bulletin No. 57 from the Agricultural Experiment Station of the University of Arizona:

"Of the various methods of measuring water, the miner's inch box has long since fallen into disrepute, and for good reasons. The use of current meters is too expensive for general use, and rating flumes are open to the same objection, as the rating itself is difficult and expensive. But in weirs we have a method which is both cheap and simple."

The concrete dimensions of box and notch for measuring various flows may be determined from the following table:

Flow in Miner's Inches. 40 inches = 1 sec. ft.	Width of notch.	Depth of notch.	Length of box.	Width of box.
Between 15 and 50	1 ft.	7 in.	8 ft.	3 ft.
" 30 " 180	2 ft.	10 in.	10 ft.	5 ft.
" 40 " 360	3 ft.	12 in.	16 ft.	7 ft.
" 60 " 550	4 ft.	13 in.	16 ft.	8 ft.
" 80 " 750	5 ft.	14 in.	18 ft.	10 ft.
" 100 " 1000	6 ft.	15 in.	18 ft.	11 ft.

USE OF ELECTRIC POWER FOR IRRIGATION AND OTHER RURAL PURPOSES.[1]

BY GEORGE C. ARROWSMITH.

In the Pacific Northwest, which includes Central Washington, where this treatise is written, irrigation is king, because there are so many thousands of acres of land that are absolutely unproductive without it, and therefore worthless; but with irrigation these lands, according to location, become amongst the most productive in the world today and have productive values of from $50 to $500 per acre year, according to kind of crop grown and degree of cultivation, such crops as alfalfa giving fair return the first year, and fruit from four to six years.

Up to date, comparatively only a small area of these arid regions is being irrigated, either by gravity canals or power pumps, or yet being served by public utility or public service corporations, and do not think either of these corporations have as yet quite grasped the tremendous possibilities for development—along legitimate lines—that await the advent of their various lines. These arid regions, when put into cultivation by means of irrigation, being so productive and so valuable have, from time to time, attracted the attention of undesirables who, heretofore, have been able to borrow large sums from banks, etc., on what appeared to be legitimate and feasible irrigation schemes by either gravity or pumping, but which were floated only for personal and immediate gain on the promoter's part, and again there has been money advanced on schemes floated that were perfectly feasible but which failed because of mismanagement. Either or both of these cases mentioned has had the effect of causing the banks and money centers to refuse loans on any and all irrigation schemes, regardless of merit; whereas, if every irrigation project that has been started had been started and carried on along legitimate lines, irrigation securities would hold first place in the banks' lists today, and power companies should use every endeavor—in and out of their sphere—to see that no fake scheme is floated, and bring about a feeling of confidence with banks and money centers, so as to bring irrigation securities to where they rightfully belong, and that is first place.

Commercially speaking, the valley of the Rhine, in Germany, is five hundred years old, has had the advantage of transportation and public utilities for generations, and is supposed to be one of the best cultivated and most productive regions of the world today, our arid regions, speaking in the same sense, have had but a few years of scattered endeavor, and I venture to say, that with another twenty years of concerted endeavor their productive value for the same area will have far outstripped that of the Rhine valley.

Then again, comparing the Eastern States with the Pacific Northwest, the former have had the advantage of public service and public utilities many years ahead of the latter; yet the latter is overtaking its older rival by leaps and bounds, until finally we shall not have to look to the East for money or any other commodity, but stand on our own bottom, absolutely sound; and the chief agent to accomplish this is the ever faithful, constant servant and empire builder, electricity. Yet not electricity alone will accomplish all this, as it will require the power companies to do the pioneering to establish absolute confidence between themselves and the farmer; establish confidence in the money centers, and induce public service corporations to follow in thir footsteps, the whole forming a combination that will create untold wealth in the Pacific Northwest.

[1]Paper presented at Portland convention N. W. Electric Light & Power Association, Sept. 11-13, 1912.

The Farmer.

Having met him in all his moods and phases; seen his struggles against all kinds of odds; seen his sterling qualities, he is, in my estimation, the best and most solid of our citizens today; is worthy of any trust reposed in him, and believe that he will meet any obligation he undertakes; provided, however, he gets just what it has been agreed that he was to have; and, granted that this be done, there will be less "kicking" from him than from any other source, he becoming rated A-1 on the books of the power company. And it should be the duty of the power companies not only to see that its own treatment of him is absolutely right, but to see to it, as far as possible, that he gets a square deal from all others in this connection.

Some say he is skeptical and always looking for the best end, and this may be because, perhaps, he has been—by accident or design—treated in a manner as to make him so. But as a class he is the broadest minded of men, and, as must necessarily be in the irrigated regions, possessed of considerable means to develop his property; and every effort should be made to meet him half way or more, and as before stated, he will not be found wanting.

The Land Speculator.

In proportion as the real farmer is good for the development of the country, so is the land speculator a detriment to the country, as he never expects to develop the land himself, but holds the same at high value and expects to get a still higher value without any of his own effort and solely through the hard work of the real farmer, by reason of the general rise in value of the district in which such land is cultivated; and anything that a power company can do to discourage speculation of this kind should be done, even to advocating a higher tax on unimproved property.

Promoter of Bona Fide Large Irrigation Projects.

Where it is feasible to obtain water for pumping in individual units the system should be encouraged as against all others, but there are numerous causes that, due to the general situation, water supply and topography, where the individual system is not practicable, in which case promoters of bona fide projects would be encouraged by the power companies and aided as far as possible to finance the project, but at the same time endeavor to get them to plan, operate and sell their land on such a system as to make it feasible and possible for the purchaser to make good, and think that a power company operating in an arid region could not do better than to carefully investigate the subject and install one fairly large system on the best plans that make the development possible, and thus set a standard of values that will force others to follow, by its example showing what can be done, and at the same time making it impossible for others to float wildcat projects.

Electric Pumping.

As I said before, electricity is the chief agent for the building up of the Pacific Northwest, and chief amongst its uses is that of being used as power for pumping water for irrigating arid or semi-arid lands, as this is the root from which all other branches of the power company's business springs, because, as the gravity canals have heretofore developed large areas of land from which sprung cities with their commercial loads of all kinds, so as these districts are further developed by electric pumping these commercial loads will increase, and as new districts are brought under cultivation by electric pumping, new towns and centers with their commercial loads spring up, and as electric pumping is all done during the summer months when commercial load is comparatively light, and as electric pumping has a diversity factor of its own, I predict that any power company fortunate enough to be situated in districts of this kind can and will build up a total station annual load factor of 75 per cent or even better; and by judicious extensions such a power company can maintain a load factor of this kind, which matters are more fully taking up in the following chapters.

Apparatus.

There are so many different sources from which the supply of water is pumped that a great many different conditions have to be met by pump manufacturers; such conditions, for example, being,

Water lifted from deep driven wells with plunger pumps;

Boosted from artesian wells with variable lifts;

From canals and rivers with constant lifts;

From shallow dug wells with greatly varying lifts, and

From rivers with greatly varying lifts, such as the Columbia.

All of the above with constant pumping heads, and any good pump manufacturer should be able to meet these conditions.

Before the advent of power companies into the irrigation field and even now, especially through the medium of the centrifugal pump, it has been my observation that the question of efficiency, general design or workmanship has been neglected, generally speaking, by the pump manufacturers, the general result being the turning out of apparatus that was inefficient, trashy in construction, and generally unsatisfactory. This class of apparatus has been the source of great trouble to power companies in that although they did not furnish the apparatus, they get, in a secondary yet very marked degree, the grief accruing therefrom from the customer direct; and also, which is much worse, the maladvertising which comes of a dissatisfied customer.

In the supplying of apparatus and power to customers there are two different selling points; one, the pump manufacturer, who, by the way, is generally represented by an agency handling everything from a sausage machine to a flying machine, and whose sole business is the selling of machinery, and he, upon being approached by a customer for a centrifugal pump, takes out his catalog and furnishes from this stock, apparatus that he thinks will fill the bill, supplying the pump with the largest prime mover he can and keeping the promised efficiency down as low as possible, so that, generally speaking, he is sure not to have to go to the expense of changes that he would have to make if he agreed to furnish an efficiency that he knew could be made, and the apparatus fail of making. On the other hand, the power company, by its agents in the field, knows the efficiencies that the different sizes of apparatus can be made to give and gives a customer a correct estimate of his power bill and is interested in many ways in seeing that the customer gets the highest kind of efficiency, and the advent of power companies—especially those furnishing power for polyphase motors with their constant speeds—will entirely revolutionize the manufacture of pumping apparatus, in that it will force the installation of apparatus particularly adapted to the conditions specified, and of the highest grade of workmanship, design and efficiency; in fact, just as well made as the power company's machinery in its own power house.

Power companies complain, as a rule, of "trouble" they have had in connection with apparatus. Some who started to sell the customer the apparatus direct have abandoned the sale first hand, on account of too much grief. Others who have not sold apparatus have the same grief, and I claim that this has arisen solely and wholly through the furnishing of apparatus in either case that was poor of design. True, it may be that the apparatus furnished by the power companies or otherwise may have been of the best near-by obtainable; still, this does not alter the fact that better could have been furnished and should be furnished at a comparatively small increase in cost. Then again, the public complains that the power rate is too high (popular cry), but of what use or of what consistency is it to cry lower rates, when by the use of efficient apparatus the public can reduce its own rate? The reduction of power rate of, say five per cent, might be the margin between success or failure of a power company. Yet in operation today the general difference between poor and good apparatus efficiency is as high as 30 per cent.

There are several ways of obviating these troubles, one of which is for the power companies to undertake the supplying of apparatus direct and at as low a price as possible, but of course not laying themselves liable for damages, such as loss of crops, etc., due to failure of the apparatus, yet even if the power companies were liable in such cases, the installation of first class apparatus would bring such cases to a minimum, so far as legitimate losses were concerned, so that the advantages of direct sale might far overbalance the disadvantages, but of course there might develop cases of losses or damages that had no foundation in fact.

Another way would be for the power companies to investigate apparatus of the different makes very thoroughly, and having satisfied themselves as to the best and most efficient, endeavor to have installed a goodly showing of them in each district. This could be done by having the pump companies do their own demonstrating or by advising indirectly the installation of the same.

But no matter which way it be done, think that

it is up to the power companies to see—both for the protection of the customer and for their own preservation—that the apparatus is right, that it is installed right and that the customer is instructed right, whereupon "trouble" with apparatus—from which all other troubles and grievances arise—will be eliminated, or at least brought to a minimum.

Moreover, the supplying of apparatus, either by sale or supervision, need not be carried on for more than one season, as by either of these methods the standard of design and efficiency will have been set, so that after this period all apparatus of the same classes would of necessity have to be of the same general design and efficiency, and which could be maintained so long as the power companies gave the pump manufacturers to understand that a certain standard must be upheld.

Today the power companies generally keep a man in the field whose sole duty it is to attend to "trouble," and his duties practically cease at the customer's entrance switch; but in reality he is the recipient of all trouble calls from the wire to the water supply, and not generally being that kind of a man—even if it were his duty—is of little help. In cases of this kind the customer is out of water and temper and is not good to meet, especially if he is isolated and where he cannot get help, and think that power companies would do well to fix up a scheme whereby competent help could be given the customer.

As before stated, efficiency has generally been neglected, but for low heads, say up to 75 feet, there should be no difficulty in obtaining from direct connected motor to centrifugal pumps of any speed, a wire to water or over-all efficiency as follows:

Quantity in Gals. Per Min.	Head in Feet.	Combined Efficiency.
450	35 to 75	53
350	35 to 75	51
250	35 to 75	49
150	35 to 75	44
85	35 to 75	35

All other classes of apparatus, such as reciprocating pumps, having higher efficiencies than these.

Even these efficiencies are conservative and will be increased considerably by the closer attention to this class of apparatus by pump manufacturers. Combined efficiency in this case should be understood as delivering water through suitable, well planned pipe lines vertically to the total head specified.

The foregoing refers generally to apparatus of 50 horsepower or under as the irrigator who uses amounts over this, and especially the very large ones, usually purchases his apparatus under the direction of some engineer, gets better results, and of course being larger units gets, by right designs, better efficiencies.

[To be continued.]

NORTHERMOST MONUMENT SET.

The last bronze monument has been set to mark the boundary between the United States and Canada and it stands on the 141st meridian, within a few feet of the Arctic ocean, nine miles east of Demarcation point and forty miles west of Herschel island. The boundary work has been carried on by Canadian and American parties, the Canadian engineers setting the monuments as the Americans surveyed the line.

TELEPHONE INDUCTION CASES BEFORE CALIFORNIA COMMISSION.

The Railroad Commission of California has set October 16 for the hearing of the induction cases. These cases have arisen upon the complaints of the Pacific Telephone & Telegraph Company against power companies of California, in which the charge is made that the proximity of the high tension power lines to the telephone wires renders the latter non-commercial. The telephone company has stated in its complaints that the resultant induction is of such a nature as to make large sections of its line practically useless for telephone purposes. It has requested the Commission to compel the power companies to move their high tension wires from 700 feet to 2000 feet from the telephone lines.

The telephone company occupies the county roads, and the power companies, recently building in California in great numbers, have also obtained franchises for stringing their lines along these same county roads, thereby paralleling the telephone lines at distances ranging from 50 to 100 feet.

The issue assumes an additional importance by reason of the fact that the contention of the telephone company, if carried to successful conclusion, would practically insure it a monopoly in the use of the county roads in a large section of the state and would force the power companies to purchase, at heavy expense, rights of way over private holdings.

The Pacific Telephone & Telegraph Company has filed four complaints in the so-called induction cases; one directed against the Sierra & San Francisco Power Company alleging interference with the lines in Santa Clara and Monterey Counties; one against the Coast Counties Gas & Electric Company alleging interference in Santa Clara and Santa Cruz Counties; and two against the Great Western Power Company alleging interference in the section north of San Francisco Bay.

In their answers the power companies have stated that the telephone company had been given full opportunity to complain or to protest before the lines were strung; that the franchises for the use of the public roads were obtained at public hearings before the various boards of supervisors; that in many instances they have made use of what is known as the "closed delta system" to prevent induction; and finally that in practical operation the power lines have not interfered with the telephone wires in a degree to impair the service.

The power companies have uniformly pointed out in their answers filed with the Commission that if the contention of the Pacific Telephone & Telegraph Company were upheld as sound, it would work an insurmountable hardship upon the power corporations, for the reason that the state is interlaced with the wires of telephone companies great and small, and the sections in which power companies could run their lines and maintain a distance of 1000 to 2000 feet would be so limited as to curtail the distributing market for electric power below the point of fair returns.

The Railroad Commission has inaugurated an investigation into the whole situation, through the agency of its engineering and service departments.

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Prosperity and the Election

Western securities seem to be holding their own in spite of a grilling presidential campaign now in full sway. In former years of similar political significance much uneasiness was felt on all sides, even to the material curtailing of Western construction.

Bumper crops are now being harvested, which combined with the fact that the squeezing of water from stocks in the past years has brought valuations to a stable and permanent basis, unquestionably accounts for the present firm showing. The latest government crop report is interesting and shows that the aggregate yield of grain in the United States for the season of 1912 is the largest on record.

The mills of the gods may, as of old, continue to grind slow and exceedingly small, but evidently the power man will have his hands full this fall speeding up the wheels for Uncle Sam and from all appearances the product will be anything but small.

Harmony Between Central Station and Dealers.

The proper attitude of a gas or electric company with regards to the sale of apparatus and appliances consuming its product is a much-mooted question. Should the dealer be encouraged to sell lamps and other devices at a profit or should the company do so? Or is it advisable for the company to sell at cost or less in the thought that it is in business to sell service rather than current? So intense has become this controversy that at times it has threatened to disrupt the excellent spirit of harmony which has been fostered among manufacturers, jobbers, central stations, contractors and dealers.

Historically speaking, lighting companies, whether gas or electric, sold appliances to their consumers long before dealers recognized this business opportunity. As a rule the company welcomed the advent of the dealer and did everything in its power to boost his sales. The dealer, however, has seldom reciprocated. His efforts to work up new business have too often been lax and he has been more interested in selling an old stock than in furnishing the most efficient equipment. As a result, many companies have been compelled to again take over the sale of appliances in order to increase current consumption. This has given rise to adverse criticism and even open antagonism made evident by favoring isolated plants or municipal ownership as opposed to central station service.

Like unto the ancient shield of the Druids, this question has two sides. That of the lighting company is admirably presented in the joint paper by L. H. Newbert and H. P. Pitts elsewhere in these columns Though nominally it is concerned with gas, it is equally applicable to electricity, and it is suggested that electrical readers make such mental substitution. The viewpoint of the contractor and dealer was clearly brought forth at a recent co-operative meeting at Henderson Harbor, N. Y., participated in by representatives from all the electrical interests.

The gas business, which preceded the electrical, has not reached the full measure of its possibilities because gas men have not co-operated. The companies give away stoves and the dealers try to sell coal ranges. The electrical men have recognized the eco-

nomic fact that co-oporation will enable them to market more goods with less friction at a lower ultimate cost than any other method. The market can be more quickly saturated by selling at cost plus profit than by selling at cost or less. If people have been educated to want the goods they will be willing to pay any reasonable price for them.

The central station and the manufacturer must recognize that in order for the dealer and contractor to take part in any co-operative plan appliances must be sold at a fair profit, as he is dependent solely upon the sale of the goods and not of the current. On the other hand, it is necessary for the dealer to realize that the solution of the question logically rests with him. Most companies would gladly relinquish this side line so as to devote their energies to the main issue if it were being handled in an aggressive business-like manner. It has been frequently demonstrated as an economic business proposition that the dealer is in a position to market appliances to a better advantage than the central station. The latter can well afford to carry on the introductory campaign, but leave it to the option of the consumer whether he purchase from the central station or from a legitimate dealer.

Economics of Electric Cooking

The ideal electric load for the central station is that which is uniform throughout the twenty-four hours of the day. The rapid rise of the tungsten lamp and other efficient types has had a tendency to lessen in some instances the aggregate consumption of electrical energy for illumination.

Electrical novelties and the many little niceties and conveniences in newly devised household appliances have, however, made the power consumption curve steadily rise from the horizontal in accelerated increments. Now comes the electric stove—no longer a mere curiosity with which the wealthy may play, but by its most recent strides placed within the economic reach of all.

Many have long wondered why the cheap generation of electrical energy has not previously made possible the utilization of the electric stove. Let us for a moment examine into this query.

The best average that is accomplished in the gas stove—the nearest competitor of the electric stove in our coast cities—is a consumption of say 3000 cubic feet of oil gas per month per family of five when gas is used for cooking exclusive of water heating and other utilizations. The average calorific value of oil gas manufactured in the large generators on the coast is 650 B.t.u. per cubic ft. Hence as an average a total of 1,950,000 B.t.u. are necessary to do the domestic cooking for a family of five. If an electric device be used, which does not increase the thermodynamic efficiency of the gas stove, it is plainly evident that 1,950,000 B.t.u. would there be necessary per month. One kw.-hr. of electrical energy is equivalent to 2545 B.t.u Hence, to satisfactorily perform the function above set forth a total of 257 kw.-hrs. would be necessary. At the usual price of 7c per kw.-hr., the household bill would be $18 per month as opposed to 3000 cu. ft. of gas at $1.00, or $3.00 per month. It is seen at a glance, therefore, that in order to be in the running, an electric cooking device must be a far superior article from a thermodynamic viewpoint. In a word it must consume far less energy in performing its heat inparting functions.

Considered again from the central station point of view interesting economic features are found. It is true that the usual type of electric cook stove, although demanding for its heat large quantities of electrical energy over short periods, calls, nevertheless, for this supply at times which are at present off-peak hours of the day. While this is a great stride in the right direction, ultimately, however new peaks will be thereby formed and deep valleys still remain in the daily load chart, showing many hours of the day and night in which comparatively little energy is consumed. Hence as a ultimate solution, even the electric cook stove though wonderfully improving present warped conditions, offers few happy thoughts of reflection to the power manager, endeavoring as a final solution to unify his load factor throughout the entire twenty-four hour period.

What, then, can be done?

In order to heat one pound of water one degree in temperature, it is necessary to supply one B.t.u. of heat energy. With the single exception of hydrogen gas, water will store more energy per unit of weight than any other known substance. Abundantly found in nature, its use is hence without limitation. A temperature of 240 degrees F. is amply sufficient to cook all eatables at the present time available in the household. To heat one pound of water from ordinary atmospheric temperatures of 60 degrees F. and transform the same into steam at 240 degrees F. will require some 1130 B.t.u. of heat energy. At this temperature and under a pressure of 25 lb. per sq. in.—but 10.3 lb. per sq. in. above atmospheric pressure without —a slight call upon this latent heat energy will cause some of the steam to condense into water without, however, lowering the temperature. Here then, is a means of securing a perfectly uniform temperature for cooking—the dream of the cook for ages gone by.

Recent experiments on electric cooking stoves, transferring their electric energies thus into heat energy, which in turn acting as a reservoir of abundant and uniform supply transmits its energy to eatables placed within a thoroughly heat insulated receptacle, have shown that a meal for an average family of five can be deliciously cooked with but an expenditure of from 400 to 700 watt hours. Per month this would be, for ninety meals, taking an average of 550 watt hrs. at 7c per kw.-hr., a total of $3.85. Such a load as this, however, may be ideally carried over the twenty-four hours a day and hence unquestionably central station managers will welcome its installation by the granting of a three-cent rate for electric power consumed in this manner. Indeed, many of the larger central stations on the coast have already instituted a three-cent rate for all forms of electric cooking devices.

Since one pound of water as instanced above will store 1130 B.t.u., it is seen that two pounds of water, hermetically sealed and insulated as carefully as is accomplished in the fireless cooker, will be able to store sufficient energy over the twenty-four hour run to supply the necessary heat to cook the three daily meals.

PERSONALS.

Garnett Young, manager of the Telephone-Electric Equipment Company, is taking a vacation from his San Francisco office.

F. G. Baum is expected to return to his San Francisco office on Saturday of this week from South America via New York City.

John Coffee Hays, general manager of the Mount Whitney Power Company, is on his way East, accompanied by Mrs. Hays.

S. Herbert Lanyan of Pierson-Roeding & Company, lies dangerously ill with the typhoid fever in the Good Samaritan Hospital in Portland.

B. A. Etcheverry, head of the department of irrigation at the University of California, is attending the Irrigation Congress at Salt Lake City this week.

H. H. Noble and **Rudolph W. Van Norden** have returned from an inspection of the Noble Electric Steel Company's plant at Heroult on the Pitt, Shasta County, California.

S. K. Colby, vice-president of Pierson, Roeding & Company, is at Chicago and will attend the sessions of the annual convention of the American Electric Railway Association.

Henry T. Scott, president of the Pacific Telephone Company, is at New York City, where he will transact some important business and meet Mrs. Scott on her return from Europe.

S. L. Shuffleton, who is in charge of the Stone & Webster Construction Company's work at Big Creek, near Fresno, California, for the Pacific Light & Power Company, is at Seattle.

Charles W. Baker, erecting engineer, and **K. G. Dunn**, electrical engineer with Hunt, Mirk & Co., have returned to San Francisco from Los Angeles and San Diego, where some important work is in progress.

A. S. Kalenborn recently joined the staff of the Oro Electric Corporation as an engineer on transmission work. **N. A. Eckart** is now with the engineering corps of the company, being stationed in the Humbug Valley.

F. R. Welles, a former vice-president of the Western Electric Company, in charge of the European business, who has been touring the Pacific Coast, recently visited the Yosemite Valley and San Francisco.

R. F. Oakes, president of the American Ever Ready Company's Pacific Coast department, will leave during the coming week for New York on his annual visit to the Eastern factories. He will remain about six weeks.

J. A. Fitts, engineer with L. L. Summers & Company of Chicago has returned to the home office from the Olympic Power Company's new power plant near Port Angeles, Wash., for which L. L. Summers & Company are engineers.

H. C. Coffman, president of the Chehalis & Cowlitz Railroad, has been appointed district manager of the Washington-Oregon Corporation at Chehalis, Wash., succeeding **W. B. Foshay**, who has arranged to look after other interests.

Jesse W. Churchill and **J. P. Churchill** of Yreka, who are the managing directors of the California-Oregon Power Company, are at San Francisco consulting with engineers and others concerning the extensions of their electric transmission system.

Seymour Guthrie, secretary-treasurer of the Kellogg Switchboard & Supply Company, arrived from Chicago and spent the past week at San Francisco. He was accompanied from Portland by **H. C. Goldrick**, manager of the Pacific Coast department.

R. L. Van der Naillen, general manager of the Oro Electhic Corporation, has returned to San Francisco after visiting Oroville and the scene of operations on Yellow Creek where preliminary work, including road making, is being done at the proposed power site.

S. J. Ornum, who as city engineer of Pasadena has just installed an attractive "white way" on Orange Grove avenue in that enterprising city, was an attendant at the League of California Municipalities Convention during the week, where he was elected vice-president of the engineering division.

S. V. Walton, commercial manager for the Pacific Gas & Electric Company, is making an extended trip throughout the East during which he will attend the Irrigation Congress at Salt Lake City, represent the Electrical Development League at the Boston Electric Show and inspect the workings of the large operating and manufacturing companies.

J. V. Kunze, manager of the Atlantic department of the Pelton Water Wheel Company, recently visited Los Angeles in connection with the securing of a large contract for lapweld steel pipe for use in connection with the Los Angeles Aqueduct power transmission system. On his return trip to New York he was accompanied by Mr. Liersch, the German representative of the Ferrum Pipe Company of Germany.

A party of electric railway men left San Francisco on October 2 for Chicago to attend the annual convention of the American Electric Railway Association, October 7th to 11th, inclusive. A compartment observation car and a standard Pullman were occupied by the following from Los Angeles: J. McMillan, general manager Pacific Electric Railway Company, with his wife and daughter; S. H. Anderson, electrical engineer, and F. F. Small (and wife) mechanical engineer of the same company; S. J. Keese (and wife) Los Angeles representative of the Westinghouse Electric & Manufacturing Company; Chris. Eccles, Los Angeles manager for Eccles & Smith. From San Francisco: J. M. Yount, Master Mechanic United Railroads; J. H. Handlon, claims agent and Thomas Finnigan, purchasing agent, and W. T. Bivins, electrical engineer of same company; J. Q. Brown, assistant general manager of the San Francisco & Oakland Terminal Railways Company; F. W. Frost, secretary United Properties Company; F. A. Richards, manager car department Pierson, Roeding & Company; A. V. Thompson, railway sales agent General Electric Company; W. W. Briggs (and wife), assistant general sales-manager Westinghouse Electric & Manufacturing Company, and G. B. Kirker of the same company; H. S. Clark (and wife), Pacific Coast manager Westinghouse Air Brake Company; J. H. Steiger, Pacific Coast representative American Brake Shoe & Foundry Company, and F. H. Jones, Pacific Coast representative General Railway Signal Company.

MEETING NOTICES.

Portland Section A. I. E. E.

The next meeting of the Portland Section of the American Institute of Electrical Engineers will be held at 8 p. m., October 15, 1912, in the assembly hall of the Electric Building. A paper on "Investigation of Transmission Line Phenomena" will be presented by E. D. Searing and E. H. Le Tourneau. These will be preceded by a short talk from F. D. Weber, delegate to the Boston A. I. E. E. convention.

Portland Engineering and Architectural Societies.

At the regular weekly luncheon on September 24 of the Engineer and Architect societies of Portland, in the Elizabethan room of the Imperial Hotel, Franklin I. Fuller, vice-president of the Portland Railway, Light & Power Company, was chairman of the day. He stated that at present he was so wrapped up in the 3-cent fare ordinance that he could talk of nothing else. He then explained that from the standpoint of the company it was an ordinance that would be impossible for the company to comply with and would result

in great hardship for the patrons of the company if it was declared to be a legal act of the city council.

The second luncheon, was equally well attended and it was announced that the joint committee had decided to make the weekly luncheon a permanent feature to be held until further notice, at the Portland Hotel on Tuesday at 12:15 p. m. of each week, also it was anounced that the joint committee had decided that in the future the presidents of the different organizations should act in succession as chairman at the luncheons. The next luncheon, October 1, will be presided over by Mr. Frank Logan, president of the Portland Architectural Club.

An interesting program will be provided, the principal speaker being Marshall N. Dana of the Greater Portland Plans Association, and it is expected that a large number will be present.

It is probable that as a result of this getting together of the various engineering and architectural organizations of the city, that a combination will be affected in the near future to co-operate in the matter of securing permanent quarters for their joint use. A move has already been made in this direction and a second joint committee is in process of formation for this purpose, members having already been appointed by the A. I. E. E. and the Oregon Society of Engineers. As soon as the other organizations select members the committee will be organized and immediate action taken in the near future on this matter.

Los Angeles Section A. I. E. E.

The Los Angeles Section of the American Institute of Electrical Engineers held its opening meeting of the year 1912-1913 at Brink's Cafe on Tuesday evening, September 24, 1912. There were present 105 members and visitors. The members and visitors on arriving were given a round tag about 1½ in. in diameter, on which was written his name and the firm he was with. They attached this to the lapel of their coats, so that each man was readily identified. Music and entertainment was provided during dinner.

After dinner, Mr. Ensign, the retiring chairman, called the meeting to order and thanked the Institute and members for their support during his term in the chair and then introduced Mr. George A. Damon, the new chairman.

Mr. Damon gave a short address and said he was going to call on everybody to make a speech. He then called upon the chairman of committees, who made a few remarks, outlining the work of the coming year. The secretary was next called upon to give a brief outline of the section work during the past year. After this Mr. Damon called upon each man present to rise and tell who he was and where he was from and if he cared, to make a few remarks.

Dr. Carhart then gave an interesting lecture on his trip through Africa, illustrating same with lantern slides.

Portland Jovian Lunch Club.

A Jovian Lunch Club has been organized at Portland, weekly lunches being held at the Hazelwood at noon on Thursday of each week. Among the speakers have been F. W. Hild, general manager, Portland Railway, Light & Power Company, F. D. Weber, of the Underwriters' Equitable Rating Bureau, C. S. Jackson of the Journal Publishing Company. The aim is to have a prominent speaker each week.

Spokane Jovian Lunch Club.

The Spokane Jovians met for a luncheon in the East room at Davenport's, September 24. After the business session was over the Statesman turned the meeting over to Mr. C. R. Bean, chairman of the day. Addresses were given by Mr. M. E. Cheney, who is the electrical inspector of the Washington State Underwriters' Association, and a splendid address was given by Mr. E. A. Lindsley on the Preservation of Timber. Thirty-six were present at the luncheon, including several visiting Jovians.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

Sept. 16.

The Southern Pacific Company applied for permission to purchase the franchises in the city of Richmond, Contra Costa County, held by John H. Nicholl, for the purpose of building an electric line from Albany to Richmond.

Sept. 17.

The Pacific Electric filed an answer denying the charge of the Long Beach Chamber of Commerce. The Long Beach Chamber of Commerce complained that the Pacific Electric failed to give adequate transfers and otherwise neglected to fulfill the terms of its franchise.

The Commission rendered a decision granting the Pacific Gas & Electric Company authority to issue $5,000,000 of bonds, the money to be used for extensive hydroelectric development on the South Yuba and Bear Rivers.

The Commission rendered a decision granting the Southern Sierras Company a certificate of public convenience and necessity to operate in Inyo County.

Sept. 18.

The Commission rendered a decision granting permission to the Home Telephone Company, of Covina, to issue 369 shares of stock.

Sept. 19.

The Coast Valleys Gas & Electric Company and the King City Water, Light & Power Company applied for authority for the latter to transfer its properties to the former.

The Southern Counties Gas Company applied for permission to issue $66,000 of bonds, for construction work and extensions.

The Central California Gas Company applied for permission to issue $30,000 of preferred stock.

The Coast Counties Gas & Electric Company filed application to purchase the property of the Davenport Light & Power Company.

Sept. 20.

The Collins Commercial Company applied for permission to run two electric wires across the streets of Newport Beach.

A brief was filed by the Tehama County Telephone Company and the Glenn County Telephone Company in their complaint against the Pacific Telephone & Telegraph Company, in which they ask for interchange of switching.

Sept. 21.

The Commission granted the Fresno Traction Company permission to construct its tracks at grade across Railroad avenue, Fresno.

The Commission rendered a decision granting the Western States Gas & Electric Company permission to issue $600,000 of bonds.

The city of Pasadena filed an argument in its action to compel the Southern California Edison Company to raise its rates.

Sept. 23.

The city of Pasadena filed a brief in its case against the Southern California Edison Company, in reply to the brief submitted by the defendant.

Sept. 24.

Decision was rendered by the Commission granting permission to the Indian Valley Electric Light & Power Company to issue 6979 chares of stock and $81, in 5 per cent bonds.

Sept. 25.

The Great Western Power Company and the North Sacramento Land & Water Company applied for an order permitting the former to purchase the electric distribution system of the latter for $9000.

The Commission rendered a decision granting authority to the Tulare County Power Company to mortgage all its property to Thomas C. Job to secure an indebtedness in the amount of $175,000.

THE ELECTRICAL CONTRACTORS' DEPARTMENT

WIRING REQUIREMENTS AT PORTLAND.

The light and power department of the Portland Railway, Light & Power Company has issued a booklet of rules and regulations governing the installation of wiring for light and power to be connected to their system. These requirements cover provisions which are not included in the Rules and Regulations of the Board of Fire Underwriters, and are deemed necessary as a protection to the customer and to the company. The company reserves the right to refuse to connect, or the right to disconnect, any installation which does not conform to them.

(A) General Wiring.

(a) Architects and contractors are requested to consult the company in regard to the location of the service outlets and meters.

(b) The company will be glad at any time to assist, free of charge, architects, contractors or owners with advice from its engineers, relative to drawing up plans and specifications for electric wiring.

(c) Wiring contractors are requested to leave their card in the cabinet box or fastened to the meter loop, for the benefit of the company in case of a misunderstanding or trouble relative to the wiring, and also where it is possible, leave a card fastened to the meter loop having thereon the name of the customer on the premises.

(d) All wiring must be done in accordance with the Rules and Regulations of the National Electrical Code, in addition to conforming to the herein requirements.

(e) All installations of more than twelve (12) sockets or requiring more than 660 watts must be wired 3-wire, with load balanced as far as possible, except as noted in the next paragraph, and in Section "B," paragraphs (c) and (d).

(f) Residences, apartments or flats having an installation of 24 sockets or less, or requiring 1320 watts or less, must be wired for 2-wire service.

By a socket is meant any kind of a lamp receptacle.

(g) Where the cooking, heating and small power equipment in residences, flats, apartments, etc., exceeds 2 kw. of connected load, the service for same will be supplied through a separate meter at a flat rate of 4 c per kw.-hr. for all consumption, providing the consumer signs a separate contract covering this additional service.

Minimum charge—$1.00 per month.

(h) Meters should always be located as near as possible to the point where the service enters the building, or as near as possible to, and on customer's side of the main line switch and cut-out.

(i) No person other than a duly authorized agent of the company is permitted to tamper or in any way interfere with the company's property, such as meters, service boxes, switches, etc.

(j) The company must always be notified before additions or alterations are to be made to the installation.

(k) The company provides transformer service cable, and meter capacity sufficient for the original installation, and any additional load may damage any or all. According to the terms of the contract with the company, the customer would be held liable for such damage.

(l) If alterations in wiring require shifting of the meter, the company must be notified in advance, as under no circumstances is any one other than a duly authorized agent of the company allowed to handle or interfere with the meter or its connections.

(B) Sign Wiring.

(a) The wires for all circuits to signs must be installed in conduit, and no outlet box of any description will be permitted in sign conduit runs. In long conduit runs, a condulet with a blank metal cover is recommended.

(b) In wiring for signs, separate meter loops must be provided for the installation of separate meters for the signs, and the controlling switch must be installed at such a point as to be accessible to the company's employes at all hours of the day and night.

(c) All signs wired for 110-120 volt lamps having more than 33 receptacles or requiring more than 660 watts, must be wired for a 3-wire service with load balanced.

(d) All signs wired for 110-120 volt lamps having 33 receptacles or less, or requiring 660 watts or less, may be wired for a 2-wire service.

(e) All signs that are to be equipped with 12-volt, 5-watt Mazda sign lamps, must be wired on the multiple-series system in the underground district, and on the regular multiple system in the overhead district. The multiple-series signs must have ten (10) multiples in series, and each multiple of any one series must contain the same number of lamps, and that number must not be less than ten (10) lamps.

(f) The wiring for all multiple-series signs must be arranged for connection to a 2-wire, 120 volt feeder-circuit when the number of lamps in the sign is between one hundred (100) and two hundred (200), and for connection to a 3-wire 120-240 volt feeder-circuit when the number of lamps is two hundred (200) or over.

(Signs of less than one hundred (100) lamps must not be wired on the multiple-series system.)

(g) The regular multiple signs in the overhead district that are to be equipped with 12 volt Mazda sign lamps, must be supplied with and connected to a 120 volt to 12 volt transformer, when the load is 660 watts or less, and to a 240 volt to 12 volt transformer when the load is more than 660 watts.

(C) Service Connections.

(a) None of the work necessary to connect an installation will be done by the company, until a contract for service has been signed by the firm or individual who is to pay for the current.

(b) Service will not be connected until the installation has been inspected and approved by the company's inspector.

(c) The company will not connect its service until all wiring is completed and all fixtures, cut-outs and switches are installed, except as provided in paragraph (d) below.

(d) If temporary connection to an installation is desired, apply in writing to the commercial department of the company, where special arrangements may be made.

(e) No charge will be made for the ordinary connection unless it be temporary.

(D) Lamps.

(a) The Edison Base Lamp is the standard of the company.

(b) The consumer must furnish the first installation of incandescent lamps, except as provided in paragraph (e).

(c) All carbon and Gem filament lamps (not including tungsten and tantalum lamps) of the sizes specified below, which have been purchased from this company and which have been burned out or blackened in use, will be replaced by the company free of charge upon the return of the old lamps, provided the burned out or blackened lamps were used on the regular lighting meter rate service.

(d) Free lamp renewals are furnished in the following sizes only: 4 c.p., 8 c.p., 16 c.p., 32 c.p. and 50 c.p., clear or frosted.

(e) High efficiency Gem lamps of sizes known as Nos. 3, 4 and 5, with prismatic glass reflectors, will be furnished and installed free of charge (they to remain the property

or the company). The necessary wiring and receptacles for same must be provided by the customer.

(f) When burned out or blackened in use, Nos. 3, 4 and 5 Gem lamps of the make supplied by the company will be replaced free of charge upon the return of the old lamps, provided the lamps were used on the regular lighting meter rate service.

(To be continued.)

PORTLAND ELECTRICAL CONTRACTORS' ASSOCIATION NOTES.

The Portland Electrical Contractors' Association, organized less than one year ago by the principal local electrical contractors, is very active in matters pertaining to their branch of the electrical industry and much harmonious enthusiasm prevails. Regular meetings of the association are held on the second and fourth Tuesdays of each month and the executive committee meets every Thursday. Association meetings are held at 6:30 p. m. when the members have their evening dinner together at one of the principal hotels after which the business of the association is transacted. To insure a good attendance at meetings, each member is assessed the amount of the meal whether he is present or not and it goes without saying that no meals are missed unless unavoidably so. Aside from the penalty feature—which is more important—is the intense interest shown in the many subjects presented for consideration.

As a result largely of the association's efforts the city of Portland recently enacted and put into force a satisfactory inspection ordinance and the members are much pleased with the manner in which Mr. Dunlap, chief inspector, is working in harmony with the contractors. At a recent meeting of the association there were present as the association's guests, Mr. Dunlap and his deputies and Mr. F. D. Weber of the Underwriters' Equitable Rating Bureau. Many questions germane to inspection matters regarding which there had been a difference of opinion, were discussed and conclusions reached. This plan eliminates the confusion and misunderstandings between the inspection department and the contractors for all concerned receives a bulletin covering each ruling so that all are informed as to what is required.

One of the principal subjects for future attention is a state license law for electrical contractors. Data is being assembled on this subject and probably active measures will soon be taken to have the bill enacted.

The West Coast Engineering Company of Portland are rewiring the Morquam Building. The installation being in rigid conduit, except the wiring of individual rooms which will be installed in flexible conduit. This contract is of more than ordinary interest as the building is of the old type of fireproof construction of concrete and tile and a steel frame. The rigid conduit in the halls and vertical risers have all been concealed. The flexible will be entirely concealed in the rooms. A new service and marble switchboard are to be installed.

The Dings Electric Company of Centralia has been awarded the contract for wiring the city of Tono preparatory to starting up the new power plant under construction. The contract includes the wiring of 100 houses, stores, opera house and street lights.

SAN FRANCISCO ELECTRICAL CONTRACTORS' NOTES.

The National Electric Company were awarded the wiring for the St. Francis Church at the corner of Vallejo street and Columbus avenue.

The Central Electric Company were awarded the contract for wiring an apartment house for W. Wilson on Mason street and Latham place, San Francisco, for the sum of $4450.

N. Hope of the Turney Electric Company and W. S. Hanbridge left Saturday night for the Santa Cruz Mountains on a business trip.

A wiring contract is soon to be let on the new Wigwam Theater on Mission street. The steel frame was recently let. The wiring will probably amount to about $4000. Charles L. Phillips is the illuminating engineer.

TRADE NOTES.

An exhibit of Klein electricians' and linemen's tools will be shown in connection with the Western Electric Company's exhibit Space No. 414, at the American Electric Railway Manufacturers' Association Convention, International Amphitheatre, Union Stock Yards, Chicago, Ill., October 7th to October 12th.

The General Electric Company announces that the order recently secured from the United Railroads of San Francisco calls for 65 G. E., four 40 h.p. motor car equipments with K. 28 J. controllers. The contract for the car bodies was placed with the American Car Company, represented by Pierson, Roeding & Co., and the trucks will be furnished by the J. G. Brill Company, represented by the same agents. The brakes will be supplied by the National Brake and Electric Company, Eccles & Smith agents. The seating capacity of each car is fifty passengers.

BOOK REVIEWS.

Wireless Telegraphy and Wireless Telephony. By Chas. G. Ashley and Chas. B. Haywood, size 6½ in. x 9 in.; 141 pages; replete with illustrations. Published by the American School of Correspondence and for sale by the Technical Book Shop, 106 Rialto Bldg., San Francisco. Price $1.00.

The uses of wireless telegraphy and telephony are many and important. To mention its life saving power alone is to secure for it a high claim to consideration. The authors of this book, both electrical engineers by profession have set forth in an interesting and attractive manner the history and principles of this great modern method of transmitting intelligence through space without the use of wires. The book is thoroughly illustrated. It contains no higher mathematics and yet sets forth the principles involved in a lucid and comprehensive manner. It will prove of interest and value to the layman desirous of gaining an insight into this great system of intelligence transmission, but especially will it prove of interest to that great body of men training themselves to be operators in this new field of endeavor.

Small Water Supplies. By F. Noel Taylor, C. E. Size 5½x7½ in.; 174 pages; 126 illustrations from drawings and photographs cloth binding. Published by D. Van Nostrand Co. and for sale at the Technical Book Shop, 106 Rialto Bldg., San Francisco. Price $2.00.

The author of this book, who is a member of the Institute of Municipal Engineers and the compiler of "A Manual of Civil Engineering Practice" has treated this subject in an easy, direct style. Too frequently the young engineer in the pursuit of his technical training has so much emphasis laid upon the great engineering feats of the profession, that the small things of life are completely overlooked Especially is this true in the building of small dams and weirs, the installation of moderate sized pipe lines and the operation of small pumps. Here is a book treating of these small, often totally neglected, subjects. In the West thousands of these small structures are daily being installed in the high mountains or arid valleys. The book before us does not delve too deeply into mathematics to befog man of but moderate attainments in the rudiments of engineeering. The following subjects are treated: Properties of water and sources of supply; wells and well sinking; flow of water in channels and pipes; pumping waters, and storage and distribution. It should find a welcome place among the younger members of the profession and indeed with all those interested in installations of this nature on a small scale of construction.

INDUSTRIAL

GENERAL OFFICE BUILDING OF FORT WAYNE ELECTRIC WORKS.

The general office building of the Fort Wayne Electric Works of the General Electric Company is located on the same grounds as the factory buildings, and overlooks one of Fort Wayne's beautiful public parks. This modern office building, erected during the summer of 1911, is a five-story structure having a ground plan of 60 feet by 140 feet. The walls are built of structural steel and brick, and the floors are reinforced concrete slabs supported by steel latticed girders of the general steel structure. In short, the construction is throughout of the most approved and up-to-date form.

The various floors of the building are served by two Otis high speed electrically driven elevators, each one having a capacity of fifteen passengers or a freight capacity of 2500 pounds. The various floors may also be reached by two square stairways, one located at each end of the building. An extension steel fire escape is also provided for emergency service in case of fire, although the building throughout is as near fireproof as it is possible to construct.

General Office Building of Fort Wayne Electric Works.

The building is equipped throughout with Grinell automatic sprinklers and a double equipment of fire hose on each floor. Fire proof vaults are also provided on each of the floors.

The rooms which serve as separate offices for the various departments are arranged on either side of the longitudinal halls. The wood work throughout is quarter sawed golden oak, finished in keeping with the other high class construction.

The building is so located and the offices so arranged that during the bright hours of the day there is an abundance of natural light. The required artificial light is furnished by a direct system of incandescent lighting, using 100 watt Mazda lamps with Holophane reflectors. The system is so efficient and the distribution so perfect that the artificial lighting is quite as satisfactory as the natural lighting.

The building is supplied with steam heat from the central power station of the works, the radiators being arranged along the exterior walls of the building. The heat is controlled first by valves in the steam mains, located in the basement of the building, and finally by hand operated valves at the radiators.

The ventilating system used in the building is unique. The air supply is drawn from the exterior at the base of the building, by a large Sirrocco fan driven by a Fort Wayne 12 h.p. variable speed motor. The air is first passed over steam pipes and heated to a temperature somewhat near that of the rooms, and is then passed through a large Warren Webster washer where it is subject to the action of a heavy spray of water which effectually removes all dust and odors. The air is again passed over steam pipes which remove the excess moisture and at the same time heat the air to the temperature at which it is desirable to the offices. A second large motor driven fan located on the roof of the building exhausts the air from the various rooms and expels it to the outside atmosphere. The ventilating equipment has sufficient capacity to change the entire air content of the building four times every hour.

The washing of the air by the water spray naturally cools

it and in the summer season this feature is utilized to keep the temperature of the rooms below that of the outside atmosphere, in fact the system is so effective that a temperature of seventy degrees can be maintained in the offices during the hottest days in summer.

An unique use is made of the telephone transmitter in connection with the motors used on the ventilating and water systems of the building. The motors are controlled from a general switchboard remotely located and since it is desirable that the engineer in charge at the switchboard should have some way of knowing whether or not the motors are operating properly without going all over the building to the location of each one, the motors are individually supplied with a telephone transmitter with mouthpiece placed quite close to the commutator of the motor, each transmitter having its individual telephone circuit terminating in plug receptacles at the switchboard. When the engineer at the switchboard wishes to know regarding the operation of a motor, he plugs a telephone receiver into terminating receptacles in the board and is able to tell if the motors be operating properly by the pitch of the humming sound which the brushes of the motors make in passing over the commutator bars, the pitch of the sound becoming higher as the speed of the motor is increased. By this method the speed of the large motor driving the exhaust fan on the roof is controlled from the switchboard in the basement, quite as intelligently as if the motor were in plain view from the switchboard, in fact the experienced engineer can by this method control the speed of any of the motors in the building quite as accurately as if the dial of a mechanical speed indicator were registering the speed directly before his eyes.

The office building contains the two panel private telephone switchboard which at present serves some 78 phones in the office and some 63 phones in the factory, and has exchange accommodations for a total of 180 'phones; moreover, each floor has its own private annunciator service, and a call bell system controlled from the private telephone exchange serves to locate the chief officials wherever they may be, in office or factory.

The electric wiring of this office is especially complete. There are a number of extra telephone and annunciator circuits, terminating in plug receptacles located at regular intervals around the base boards of the various rooms, so that no matter where it may be desirable to place a desk, there will be a convenient terminal for the plugging in of telephone and annunciator. There are also power circuits provided with numerous plug receptacle outlets at the base boards so that desk lamps and small power motors, etc., can be accommodated should they at any time be desired.

The building is also piped for vacuum cleaning service although this feature is not utilized at the present time.

No expense has been spared in equipping this office building in the most approved and up-to-date manner. The increased efficiency of the office force has shown that the added expense was more than justified.

ADJUSTABLE SPEED PAPER MACHINE DRIVE.

Speed range, speed regulation and sufficient power at each speed are of prime consideration in paper-machine drives and for all machines requiring any appreciable speed range the use of direct-current motors becomes necessary and a direct-current supply is therefore required.

When the main energy supply is alternating current, as is usually the case in paper mills, direct current is most advantageously obtained by means of a synchronous motor-generator since it runs at high speed, which is constant regardless of load, occupies little space, requires practically no attention, and improves the power factor of the system.

With direct-current motors three methods of speed control are possible.

1. Entirely by motor field control.
2. Entirely by armature voltage control.
3. Partly by motor field and partly by armature voltage control.

Although the first method may appear the cheapest in a plant where there are several machines, because it seems to require only one constant voltage, the method is open to at least three objections: First starting and stopping individual motors, disturbs the voltage enough to affect other machines, making a separate generator preferable for each machine, even with field control; second, with constant voltage and field control, the capacity of a motor remains constant at all speeds, while the power required to drive a paper machine varies with the speed; in this case the motor must be too large for slow speeds in order to have enough capacity for the high speeds; third, only a limited range can be satisfactorily obtained.

With armature voltage control, the second method, a motor can develop practically full-load at all speeds, but the full speed range by voltage control is not advisable for three reasons: First, the torque required by a paper machine is somewhat greater at low than at high speeds, so that a motor designed for the maximum speed conditions is not capable of carrying the load at low speeds; second, the regulation of a generator and motor at low voltages is not good, hence only a limited range can be obtained by this method; third, the ventilation of the motor is much poorer at low speeds and the temperature will increase as full-load torque or over is developed.

By using part motor field and part armature voltage control the exact power requirements can be met with the least investment and also the best speed regulation.

The experience of the Westinghouse Electric & Manufacturing Company favors the last method.

Systems have been installed with a speed range of 10 to 1, although this is necessary only in mills producing a large variety of products. The first cost of the electrical equipment for such a system, is slightly greater than for smaller speed ranges. Actual service has demonstrated that this system is reliable and easily controlled, that it gives very close regulation and maximum production.

NEW CATALOGUES.

Bulletin No. 501 from the Triumph Electric Company is devoted to the Triumph-Monitor Reversing Motor Planer Drive, a direct connected motor and controller involving several newly patented features and which it is claimed greatly increases the output from the planer.

Descriptive Leaflet 2480 issued by the Westinghouse Electric & Manufacturing Company covers rules for the selection of machine tool motors and gives some valuable information relative to this subject, together with several application views. Descriptive Leaflet 3516 also covers machine tool motor applications giving ratings and class of motors which are suitable for the various types of machine tools. This is exceedingly interesting information put up in serviceable form. A diagram is also given which shows the relation between the cutting speed in feet per minute and the area of cut in square inches, also the cubic inches of cut per minute.

The General Electric Company has designed and standardized switchboard panels which long experience and accurate knowledge of requirements have demonstrated will successfully meet the demands for which they are intended, and has just issued two bulletins; one illustrating and describing alternating current switchboard panels for three-phase, three-wire circuits, of 240, 480 and 600 volts, 25 to 60 cycles, and the other describing direct current switchboards, double polarity, 125, 250 and 600 volts. These bulletins are numbered 4996 and 4995, respectively.

NEWS NOTES

INCORPORATIONS.

OROVILLE, CAL.—Deer Creek Power Company $1,000,000 shares, $100 each, subscribed $5000, by M. C. Polk, C. L. Crowder, L. M. Fletcher, F. H. Polk and P. Henshaw.

ILLUMINATION.

TACOMA, WASH.—The City Commission has awarded the contract for copper wire to be used in the municipal lighting system to Bowie & Love, of Tacoma. Price, $7560.

SAN BERNARDINO, CAL.—The Southern Sierras Power Company of this city is preparing to invade the Yucaipa valley, Redlands, Banning, Beaumont and the intermediate section.

KELSO, WASH.—The Independent Electric Company has been granted the right to construct electric light lines and transmission lines over and along the roads and streets in Cowlitz county.

CHINO, CAL.—Sealed bids will be received up to November 25th for a franchise granting the right to maintain for 25 years a system of gas pipe lines along the streets of the city of Chino.

ALAMEDA, CAL.—The Electricity Commission has accepted the plans of M. C. Couchot for a new building to house the municipal light plant. The building is to be of steel and concrete and will cover a large amount of new machinery.

VANCOUVER, B. C.—Bids will be received by Wm. McQueen, city clerk, up to October 17th for the installation of ornamental light standards on Main, Granville, Harris and Hastings streets. Marked check for 5 per cent of the bid required, payable to the city treasurer.

LAS VEGAS, N. M.—The city council has empowered the water and light committee to contract with the Las Vegas Light & Power Company for a suitable system of street illumination, provided the annual expense does not exceed $2000 and the contract does not have a life of over five years.

PORT ALBERNI, B. C.—Anderson, Warden & Wilkin, consulting engineers, Williams building, have been commissioned to prepare plans and estimates for a proposed electric light plant at this place. It is possible that the Canadian Pacific Lumber Company will be asked to supply the power and that lights will be afforded early in 1913.

EDMONTON, CANADA.—The city of Edmonton, Alberta, which is figuring on expending $1,000,000 on a gas distributing plant and other buildings this year, has taken out permits for car barns costing $50,000; power house extension, $40,000, and civic shops, $19,000, upon which work is in propress. The gas plant will cost $771,000.

TULARE, CAL.—Authority to the Tulare County Power Company to execute a mortgage of all its property to Thos. C. Job to secure an indebtedness of $175,000 has been granted by the Railroad Commission. The company at the present time is indebted to Job only in the sum of $50,000 and the decision requires that the mortgage be placed in escrow and be delivered to Job when he shall place the sum of $125,000 in the hands of the trustee. The money is desired to liquidate existing indebtedness incurred largely in the purchase of machinery.

PORTLAND, ORE.—The Northwestern Electric Company, of which Herbert Fleishhackeer of San Francisco is president, has been granted a 25-year franchise to distribute electric power in Portland to be transmitted at 66,000 volts from hydroelectric plants on the White Salmon River. For this franchise the Northwestern Electric Company agrees to pay a yearly rental of 3 per cent of all power sold, put up a $100,000 bond to be forfeited to the city if $300,000 worth of work is not done on the company property within two years, permit the use of its poles for the city's fire alarm system and give the city power to condemn all its physical property if it should sell out to a competing concern. A maximum of 9 cents per kilowatt hour is established for lights, with from 5 cents to 1 cent the rate for power, according to the quantity. Referendum petitions are being circulated to have this matter placed before the voters at an election next June.

TRANSMISSION.

GRASS VALLEY, CAL.—Managing Director John Andrews is to have electricity installed at the Quicksilver mine near Alleghany.

JACKSONVILLE, ORE.—It is announced that the California-Oregon Power Company will at once construct lines, including a line to Jacksonville.

HILGER, MONT.—The Kendall Light & Power Company, has secured a franchise to install electric lights here and will run a line from its power plant on Warm Springs Creek.

MANHATTAN, NEV.—A high current power line is being erected between the substation of the Nevada-California Power Company and the Manhattan Water Company's well on the Tonopah road. An electric pump will be running as soon as the line is ready.

NAMPA, IDAHO.—The Swan Falls power plant, now the property of the Mainland interests and which furnishes power for all the towns in this vicinity, is to be doubled in capacity before the end of next year. A transmission line is to be constructed connecting the Swan Falls plant with the irrigation district south of Mountainhome.

AMERICAN FALLS, IDAHO.—James H. Brady has transferred his electric power interests in Idaho to Kuhn Brothers of Pennsylvania. Over $2,000,000 was paid over to the ex-governor for his holdings. The deal involves the power site at American Falls, together with the power house now built and in operation and the new power house now under construction at the place named. The transmission lines and substations located at Pocatello, Blackfoot and other southeastern points, together with the lighting contracts in Pocatello, Blackfoot and elsewhere were also included.

CONCRETE, WASH.—E. C. Macey, superintendent of construction of the Bellingham district of Stone & Webster Engineering Corporation, is looking over the route for bringing in their new power transmission line. Stone & Webster will, within a few weeks, begin the construction of two transformer stations, one at each of the cement plants here. C. H. Tornquist, an engineer of the Bellingham district, will look after the work.

SAN FRANCISCO, CAL.—In granting the Indian Valley Electric Co. permission to issue 6979 shares of stock and 5 per cent bonds to $81,535 the Railroad Commission settled an interesting point of policy that had been worrying several power companies. At the hearing on the application for the issue representatives of the Round Valley Water Company appeared, and stated that they were about to construct a plant in territory that the Indian Valley Company intends to serve. They said they did not oppose the application of the other company, but merely notified the commission of their intention, so that it might be taken into consideration when the Indian Valley Company's request was passed upon. In commenting upon this the commission says in its decision: In reaching its decision on the present application, the Commission will not refuse authority to one utility to issue securities on the ground that another utility may thereafter enter the field and compete with the existing utility in such a manner as to injure its business and impair the value of its securities. The commission will judge each application on

its merits, but will not be foreclosed by the grant to one utility of the right to issue securities, from thereafter permitting another utility of like character to enter the same field in case the public convenience and necessity demand such action. As has been frequently said by this commission, the commission does not guarantee any stocks, bonds or other securities which it authorizes, and no order of authorization can thereafter be used to prevent this commission from taking such action as it may consider necessary in behalf of the public convenience and necessity as affecting either the utility which secures the authorization or any other utility. The commission, consequently, will judge of the present application on its own merits, irrespective of possible subsequent competition.

TELEPHONE AND TELEGRAPH.

EL PASO, TEX.—The North Western line is repairing the telegraph lines and equipment, and the bridges destroyed by the rebels are being permanently reconstructed.

CANUTILLO, MEX.—The Tri-State Telephone Company has started work on its new line from El Paso to Denver, Mr. Riely is in charge of the construction camp at Canutillo.

BREMERTON, WASH.—A board of naval officers is engaged in making a survey of the higher ground near the entrance to Puget Sound for a new wireless station, the Tatoosh station having proved inefficient.

PORTLAND, ORE.—The electrical workers of Portland have declared a strike against the Postal Telegraph Company because of their refusal to pay the minimum wage scale of journeymen electrical workers.

LAKEPORT, CAL.—Application has been made by the Lake County Telephone Association for a franchise to construct a telephone system in the town of Lakeport. Sealed bids will be received up to November 4th for the sale of said franchise.

TOMBSTONE, ARIZ.—R. J. Selkirk, supervisor of the Coronado national forest, is considering the feasibility of constructing a telephone line from Canille to Ft. Huachuca, and from that point to connect with Huschuca ranger station. The total distance is estimated at 25 miles.

LOS ANGELES, CAL.—The Marconi Wireless Telegraph Company of America is making many changes in equipment in stations formerly operated by the United, and will modernize all stations and boats. The station located at East San Pedro will be thoroughly overhauled and modernized.

TRANSPORTATION.

STOCKTON, CAL.—The Stockton Electric Railway Co. has made application for a franchise granting the privilege to construct and operate a double or single track street railroad through the streets of Stockton. Bids will be received up to October 14th for the sale of said franchise.

PORTLAND, ORE.—One-fourth of the work on the Southern Pacific's interurban electrification from Portland to Eugene, has been completed. Track-laying, rail-bonding, pole-setting and wire stringing is well under way along the 100-mile loop and many of the city lines are being reconstructed.

PORTLAND, ORE.—The city council has passed an ordinance which makes it illegal for the Portland, Railway, Light & Power Company to collect more than 3 cents from passengers after the seats are filled. A temporary injunction has been brought by the company and the case is being heard before the United States District Court.

SEATTLE, WASH.—Local railway men are inclined to believe that J. P. Graves of the Spokane & Inland is behind negotiations for the purchase of the Highland Park & Lake Burien electric road, now nine miles long, from Seattle to Lake Burien. It is thought to be the first link in an interurban chain to Tacoma, Olympia, Chehalis and Portland.

EUGENE, ORE.—W. E. Coman, general freight and passenger agent of the Hill lines in Oregon, has advised the president of the Eugene Commercial Club of the definite announcement by Joseph H. Young, president of the same railroad system, that the Albany-Eugene extension of the Oregon Electric Railway would be completed and in operation in time to permit of a celebration of the event by the people of Lane County October 15.

SAN JOSE, CAL.—The adjourned hearing of the application if the San Jose Terminal Railway Company for leave to issue $650,000 bonds to cover the cost of extensive construction work was called before Commissioner Thelen Thursday afternoon. H. H. McCloskey, the counsel for the terminal company, supported its contention and was opposed by Col. D. H. Bryant of San Jose, who appeared in behalf of Mrs. Mary E. Lockwood of New York and other protestants. Colonel Bryant's view was that the Railroad Commission should not authorize the issuance of any bonds until the terminal company had first paid his client $14,000, alleged to be due on a contract of sale of some of the property. J. J. Mahoney, the president of the terminal company; Vice-President and General Manager John A. Mehling; Secretary M. J. Gardner and Chief Engineer W. E. Gruver attended the hearing.

SAN FRANCISCO, CAL.—An agreement is near between the city and the United Railroads for the joint use of the outer tracks on lower Market street. The United Railroads is willing to assign to the city its Sutter street franchise controlling the tracks on condition that it be given the right to operate its Sutter street cars to the ferry. It is ready to give the Geary street municipal railway cars the primary right to run over the outer tracks down Market street, to share its wires, tracks and poles with the city and to grant every other important concession which the city asks. But the company will not forfeit its alleged right to operate the Sutter street cars over the contested route. Briefly, it is ready to concede anything and everything as long as it retains the right to send the Sutter street cars to the waterfront. It is not particular under what agreement it shall do this, as long as it is legal and absolutely secure. W. M. Abbott, counsel for the United Railroads, offered the above terms and similar propositions to the Supervisors' public utilities committee at a conference Monday.

LOS ANGELES, CAL.—The principal points in the notice of sale of the San Pedro street franchise are as follows: Maximum limit of franchise 21 years and city reserves the right to purchase on one-year notice. If the city exercises its option within five years after the date of the franchise it will pay exact cost; after five years 75 per cent. City is to supervise construction and determine cost of labor and materials. The Pacific Electric and Los Angeles Railway have the right to joint use of the line with the city for seven years from date of franchise even if the city should purchase. The city reserves the right to grant any other company a franchise to use the line jointly for the seven-year tenure. If the city purchases before the expiration of seven years the railroads having joint use are to pay rental equal to 5 per cent of the price paid by the city. This rental is apportioned on a car mileage basis and the cost of maintenance is apportioned in the same way. The board of public utilities is given the right to determine the number of cars that may be operated over the line. Only three cars to a train are permitted except by special permission of the board of public utilities. Only passengers and U. S. mail may be carried by the railroad. The municipal line may carry freight. Grooved girder rails are required and the railroads must pave between the tracks. The track must be maintained to 85 per cent of the first cost during the seven years tenure. The line must be completed within five months from date of franchise, September 4, 1912—Council rejects notice of sale and decides to hold street open for municipal road. September 10, 1912—Council reconsiders its action in rejecting notice of sale. September 17, 1912—Council orders notice of sale published, bids for the franchise to be received October 8th.

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Wanted and For Sale

The rate for advertisements in this column is $1.00 per insertion for 25 words or less; additional words 2 cents each, payable in advance. Remittance and copy should reach this office not later than Monday noon for the next succeeding issue.

Replies may be sent in care of the Journal of Electricity, Power and Gas, Rialto Building, San Francisco.

OFFICE AND STORAGE ROOM FOR RENT.—Very desirable location for Electrical Manufacturers' Agents. Levy Electric Co., 539 Market St., opp. Sansome, San Francisco, Cal.

FOR SALE.—Surveying instruments of Keuffel & Esser design, including transit, level, protractors, level rods, tapes, aneroid barometer; all practically new; will sell at once for 65 per cent of catalog value. Box 35, Journal of Electricity, Power and Gas.

WANTED.—A first-class man to fill position as head of the Stores and Supplies Department of a large Electric Company operating in California; must be capable, efficient, energetic and well informed as to store keeping and store accounting on an extensive scale. Reply, stating experience and references, Box 66, Journal of Electricity, Power and Gas.

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